

Apple.
 Pear.
 Quince.
 Plum.
 Sweet cherry.
 Sour cherry.
 Peach.
 Choke cherry (*Prunus Virginiana*).
 Wild black cherry (*Prunus serotina*).
 Japanese or flowering quince (*Pyrus Japonica*).
 Cultivated raspberry.
 Cultivated blackberry.
 Cultivated strawberry.
 Lilac.
 Mock orange syringa (*Philadelphus coronarius*).
 Horse chestnut.
 Red-pith elder (*Sambucus racemosa*).
 Common elder (*Sambucus canadensis*).
 Flowering dogwood (*Cornus florida*).
 Native basswood.
 Native chestnut.
 Privet or prim (*Ligustrum vulgare*).
 Red currant.
 Cultivated grape.

In making the records, the events to be noted are those specified by Hoffmann, taken from normal or average plants—surface of leaf first visible; first flower open; first fruit ripe or full colored; half or more of the leaves full colored. To these should probably be added the date of nearly complete defoliation for those species whose leaves color some time before they fall. All aberrant or unusual flowering seasons should be recorded, but they should be distinctly marked in order that they may not be confounded with the normal events. All sudden meteorological changes which noticeably affect the plants under observation should be noted, as frosts in fall and spring, and high winds when defoliation is taking place. In short, the observer should endeavor to make his notes in such manner that they shall record the entire movement of the seasons.

Persons who spend their summers in resorts at the seacoast, in the mountains, or elsewhere, can make useful records, provided they visit the same places year by year. They can select a few typical plants, and observe their conditions at time of arrival and departure. At the same time, they can often make records of the progress of harvests of hay and grain, and other staple crops.

PROGRESSIVE MOVEMENT OF THUNDERSTORMS.

By A. J. HENRY (dated October 28, 1896).

In a letter of September 24, Mr. J. E. Lanouette, observer, Weather Bureau, in charge of station at Tampa, Fla., says:

I have the honor to ask for some information in regard to the prevailing direction of thunderstorms at other stations on the Gulf Coast. Thus far this summer the prevailing direction at this station has been from the southeast to northwest.

During the four years and more that I was on duty at Titusville the thunderstorms invariably developed either in the southwest, west, or northwest.

I remember but one instance where the storm developed in a quadrant different from those mentioned, and that was on the coast to the northeast of Titusville.

At other stations where I have been on duty, a thunderstorm moving from the southeast to northwest would be an abnormal direction, but here it seems to be normal.

This subject has at different times been discussed in this office, and while the general opinion favors this direction as due to the greater amount of vapor present in the Gulf, it would be interesting to get the views of the Bureau on this point, for if this theory is correct it would explain the eastern movement on the east coast toward the Atlantic, and the directions at Corpus Christi and Galveston should be toward the Gulf.

Key West, being uninfluenced by the same conditions which are present on the main land, should show a direction different from any of those mentioned.

In this connection I would say that the cloud movement here is very sluggish, more so than at any station where I have served.

The following reply to the above has been made and will, it is hoped, stimulate further study of this subject by others.

The questions propounded by Observer Lanouette are of no little interest since they invite a study of thunderstorms in the region of greatest frequency in the United States, where also the conditions of formation are somewhat different from those which obtain in more northern latitudes.

Tampa lies near the dividing line between the general westerly and easterly motions of the air strata in which thunderstorms originate and at a considerable distance south of the center of cyclonic systems passing eastward. In fact it would seem there is no simple relation between the position of a cyclonic system farther north or northwestward and the occurrence of thunderstorms in the Gulf States and Florida Peninsula. Moreover, the fact that the maximum frequency of thunderstorms occurs during July and August when the general easterly movement of the atmosphere is more or less feeble and the tendency to the formation of cyclones less pronounced, seems to warrant the belief that cyclonic influence has little share in the development of thunderstorms in this region. It is also believed that the thunderstorms experienced in the Florida Peninsula are less violent than those of the Mississippi and Ohio valleys. Additional information upon this point, however, is desired.

The data of the subjoined table show the direction of movement of thunderstorms at selected stations on the Gulf and South Atlantic coasts. For the sake of comparison the values for each of the eight principal points of the compass have been expressed as a percentage of the whole number of storms observed.

It is obvious that the general direction at the majority of the points selected is from some westerly quarter, the notable exception being Key West. The direction of motion at the latter station, as might be expected from its geographic position, is wholly different from that of the remaining stations, with the possible exception of Tampa. Key West lies well within the influence of the northeast trades at all times, and it is not surprising that the prevailing direction of thunderstorms should be toward a westerly quarter.

Tampa and Jupiter, the nearest stations to Key West, lie near the line of division between the prevailing easterly winds of the middle latitudes and the westerly winds of the Tropics, but on opposite sides of the peninsula. The direction of motion at Tampa is somewhat similar to that at Key West, but it is evident that the controlling conditions at Jupiter are essentially different from those which prevail at both Tampa and Key West.

The great majority of thunderstorms at Jupiter move from the southwest to the northeast—from the land to the ocean; the prevailing direction at Tampa is not so well marked, but it is evidently from the east and southeast—from the land to the ocean—as at Jupiter. The irregularity of movement at Tampa, as shown by the table, may be accounted for by assuming that the local circulation is at times within the influence of the general easterly drift of the atmosphere and again controlled by the westerly movement of the air within the Tropics. The more probable explanation, however, would seem to be that the movement of individual thunderstorms is controlled by the pressure distribution and other local influences.

Comparing the direction of progression on the two sides of the peninsula it is found that the majority of storms on either side approached from the landward side of the point of observation where the conditions of thunderstorm formation are most favorable.

Strong evidences of local control of thunderstorm movement appear in the statistics for Titusville, Pensacola, and Savannah. While there is a general easterly movement in each of these cases, as over the adjoining territory, there is, on the other hand, such a preponderance of storms from one particular direction as to be explicable only on the ground of local influences.

At all of the stations examined, except Key West and Tampa, there is a noticeable absence of storms moving from the east, and this is true whether the station is situated on the coast or inland.

There does not appear to be any definite relation between surface winds and the direction of thunderstorm movement. During August and September the influence of the northeast trades is felt as far north as the Carolina coast; the prevailing northeasterly and easterly winds do not, however, during these months, appear to exert any appreciable effect on the direction of thunderstorm movement.

Percentage of thunderstorms that have been observed moving from each of the eight principal points of the compass, January, 1892, to September, 1896.

	N.	NE.	E.	SE.	S.	SW.	W.	NW.
New Orleans.....	5	13	4	16	9	41	6	5
Mobile.....	8	9	4	17	12	20	15	15
Montgomery.....	5	7	4	4	3	32	25	21
Pensacola.....	4	21	5	5	6	27	6	25
Tampa.....	4	8	21	17	11	16	16	7
Key West.....	3	11	35	19	15	10	7	1
Jupiter.....	7	5	5	10	10	37	14	12
Titusville.....	1	0	2	3	7	53	10	24
Jacksonville.....	4	13	3	10	5	29	14	21
Savannah.....	3	4	1	2	7	38	42	12
Atlanta.....	13	7	4	4	3	27	24	19
Wilmington.....	4	12	3	5	4	29	14	29
Charlotte.....	12	8	1	2	10	23	26	16
Hatteras.....	1	2	5	8	6	30	29	19

The table below shows the distribution of thunderstorms throughout the year. As before stated, the period of maximum frequency falls in July and August at all stations except Jupiter, Charlotte, and Montgomery. At the first named a primary maximum occurs in May and June, with a secondary maximum in August. At Charlotte the maximum occurs in June and July, while at Montgomery (and also in a less marked degree at Mobile) the maximum period includes the three summer months June, July, and August. Winter thunderstorms occur mostly at New Orleans, Mobile, and Montgomery. The record for Pensacola is incomplete, the direction of motion of a large number of storms not being recorded.

Number of thunderstorms of which the direction of motion was observed from January, 1892, to September, 1896.

Stations.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.
New Orleans, La.....	3	6	10	10	24	25	38	38	11	1	1	4	171
Mobile, Ala.....	3	10	13	10	13	42	58	70	18	6	1	3	265
Montgomery, Ala.....	3	4	5	12	18	43	39	37	2	4	6	6	203
Pensacola, Fla.....	3	4	6	4	14	12	27	20	0	0	0	0	99
Tampa, Fla.....	3	4	6	4	15	20	34	36	0	0	0	0	132
Key West, Fla.....	3	4	6	4	14	12	27	20	0	0	0	0	154
Jupiter, Fla.....	3	4	6	4	15	20	34	36	0	0	0	0	110
Titusville, Fla.....	3	4	6	4	14	12	27	20	0	0	0	0	196
Jacksonville, Fla.....	3	4	6	4	15	20	34	36	0	0	0	0	244
Savannah, Ga.....	3	4	6	4	14	12	27	20	0	0	0	0	232
Atlanta, Ga.....	3	4	6	4	15	20	34	36	0	0	0	0	103
Wilmington, N. C.....	3	4	6	4	14	12	27	20	0	0	0	0	188
Charlotte, N. C.....	3	4	6	4	15	20	34	36	0	0	0	0	163
Hatteras, N. C.....	3	4	6	4	14	12	27	20	0	0	0	0	97

LOW PRESSURE IN ST. LOUIS TORNADO.

By JULIUS BAIER.

In a footnote, on page 77 of the REVIEW for March, 1896, Mr. Frankenfield gives a preliminary note as to the low pressure observed at the center of the St. Louis tornado by a son of Mr. Klemm. On account of the interest that attaches to any such

observation, a special study of the subject has been made, at his request, by Mr. Julius Baier, a civil engineer of St. Louis, whose report we herewith give in full. Mr. Frankenfield, to whom the report is addressed, states that the minimum reading, 671 mm., with an uncertainty of 5 mm. either way, when reduced to sea level gives a reduced reading of 26.94 inches, with an uncertainty of 0.20 inch, which pressure is lower than his estimate of 27.30, as published in the March REVIEW. Mr. Baier's report is as follows:

The barometer and also a thermometer were fastened to a carved wooden frame and at the time of storm hung near the window on the first floor of the home of the late Richard Klemm, ex-park commissioner of the city. As the storm struck the house a son of Mr. Klemm who was sitting in the room at the time was startled, on looking toward the window, to see the index hand of the barometer almost opposite its usual position, that is, pointing almost vertically downward. This was immediately preceding the damage to the roof, upper walls, and contents of the house and the general excitement incident to the same. The barometer was picked up from the floor after the storm, but only the wooden frame had been injured. The observation is dependent, not on reading and remembering the figures on the scale, but on noting a definite position of the index hand, a fact which would readily impress itself on the mind and be easily remembered. [Accompanying sketch, showing aneroid face and probable position of the index is not reproduced.]

Through the courtesy of Prof. F. E. Nipher, I have recently tested the barometer under reduced pressure at the physical laboratory of the Washington University. I inclose a copy of the results in detail as well as a sketch showing graduations on the scale of the instrument. The pressure was run down once and up three times with fairly uniform results, as compared with readings of the level of the mercury in a U-tube gauge. The large error of instrument at the lower readings is probably due to the fact that the recording mechanism is near its limit. Readings in column No. 1 were taken while reducing the pressure; No. 2, while gradually raising the pressure; Nos. 3 and 4 were taken by successively exhausting to the lowest point and then making the index balance for some little time at each reading as the pressure was raised. [Probably this means that the aneroid index and the mercury gauge stood at the same readings for some little time.] The last reading was made with greatest care and given most weight in averaging. Observations correct within one or two millimeters.

I think it is safe to assume an observed reading of, say, 685 mm., which when corrected, becomes 671 as the actual pressure [for the minimum pressure, May 27, in the center of the tornado], with possible error of, say, 5 mm. either way. The instrument has on it the name of W. Schriebl, Heilbronn.

Comparisons of aneroid with a mercury gauge.—The initial barometer pressure in the laboratory, i. e., that pressing on the outside of the mercurial gauge, was derived as follows: Mercurial barometer 29.47 inches, or 748.5 mm.; attached thermometer 75° F.; correction for temperature 3.2 mm.; corrected mercurial barometer of the physical laboratory, 745.3 mm., which corresponds to the reading 0 mm. on the mercury gauge. As the pressure was diminished within the receiver of the air pump the amount of exhaustion was indicated both by the rise in the readings of the mercury gauge and by the fall in the readings of the inclosed aneroid. The comparative readings are shown in the following table:

Aneroid.		Mercury gauge.					Correction to aneroid.	Pressure by cor- rected aneroid.
Reading.	Fall.	Readings.				Mean.		
		1	2	3	4			
mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
745	0	0	0	0	0	0	0	745
730	25	26	26	.....	.....	26	— 1	719
715	30	34	32	.....	.....	32	— 2	713
710	35	.....	38	.....	.....	38	— 3	707
705	40	44	44	.....	43	43	— 3	702
700	45	.....	50	.....	.....	50	— 5	695
695	50	58	58	.....	56	56	— 6	689
690	55	.....	67	63	66	65	— 10	680
685	60	76	74	74	73	74	— 14	671
680	65	.....	85	83	83	83	— 18	662

[Owing to the imperfect elasticity of the ordinary aneroid boxes the corrections deduced from comparisons rapidly made in a vacuum chamber are not always applicable to observations made under the slower changes that occur in the natural atmosphere. In the present case, however, the corrections deduced by Mr. Baier are probably more accurate than the original observation by Mr. Klemm.—Ed.]